VICKSBURG NATIONAL MILITARY PARK ~~ROADS AND BRIDGES~~ Roads and Bridges,
MELAN ARCH BRIDGES
Spanning various tributaries at Confederate Ave.
Vicksburg vicinity
Warren County
Mississippi

HAER No. MS-14-A

HAER
MISS
75-VICKV,
6A-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Department of the Interior
1849 C Street, NW
Washington, DC ~~20013-7127~~
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HAER
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HISTORIC AMERICAN ENGINEERING RECORD

VICKSBURG NATIONAL MILITARY PARK ~~ROADS AND BRIDGES~~,
MELAN ARCH BRIDGES
HAER NO. MS-14-A

BRIDGE NO. 1, HISTORIC NO. 5
(FHWA 5600-001P)

BRIDGE NO. 2, HISTORIC NO. 4
(FHWA 5600-002P)

BRIDGE NO. 3, HISTORIC NO. 3
(FHWA 5600-004P)

BRIDGE NO. 4, HISTORIC NO. 2
(FHWA 5600-005P)

BRIDGE NO.5, HISTORIC NO. 1
(FHWA 5600-006P)

BRIDGE NO. 7, HISTORIC NO. 10
(FHWA 5600-011P)

BRIDGE NO. 8, HISTORIC NO. 9
(FHWA 5600-012P)

BRIDGE NO. 9, HISTORIC NO. 8
(FHWA 5600-013P)

BRIDGE NO. 10, HISTORIC NO. 7
(FHWA 5600-014P)

Locations:

Milepost 0.2, Union Avenue spanning a branch of Durden Creek, Vicksburg National Military Park, Vicksburg, Warren County, Mississippi
UTM: 15/702650/3580590

Milepost 1.2, Union Avenue spanning a branch of Durden Creek, Vicksburg National Military Park, Vicksburg, Warren County, Mississippi
UTM: 15/702960/3581610

Milepost 6.4, Union Avenue spanning a branch of Mint Spring Bayou, Vicksburg National Military Park, Vicksburg, Warren County, Mississippi
UTM: 15/702200/3583710

Milepost 6.7, Union Avenue spanning a branch of Mint Spring Bayou, Vicksburg National Military Park, Vicksburg, Warren County, Mississippi
UTM: 15/701560/3584090

Milepost 6.9, Union Avenue, Vicksburg National Military Park, Vicksburg, Warren County, Mississippi
UTM: 15/701560/3584090

Milepost 14.4, Union Avenue spanning a tributary of Durden Creek, Vicksburg National Military Park, Vicksburg, Warren County, Mississippi
UTM: 15/701330/3579120

Milepost 14.5, Union Avenue, Vicksburg National Military Park, Vicksburg, Warren County, Mississippi
UTM: 15/701400/3579270

Milepost 15, Union Avenue, Vicksburg National Military Park, Vicksburg, Warren County, Mississippi
UTM: 15/701600/3579610

Milepost 15.1, Union Avenue, Vicksburg National Military Park, Vicksburg, Warren County, Mississippi
UTM: 15/701700/3579720

Date of Construction: 1903

Engineer: Unknown

Builder: William T. Young, Nashville, Tennessee

Present Owner: U.S. Department of the Interior, National Park Service, Vicksburg National Military Park

Structure Type: Concrete arch bridge

Present Use: Vehicular bridge

Significance:

The nine Melan arch viaducts on Union Avenue were an integral part of the overall tour route through Vicksburg National Military Park, providing visitors safe and easy access to points of interest. These bridges were designed and constructed to provide a sense of uniformity and continuity in the park landscape. Bridge No. 8, spanning the Illinois Central Railroad, was removed in the 1960s, leaving eight of the original 9 bridges.

Project Information:

The Vicksburg National Park Roads and Bridges Recording Project was conducted in 1997 by the Historic American Engineering Record. The project team consisted of Todd Croteau, project supervisor; Tim Davis, supervisory historian; Pete Brooks, field supervisor and architect; Deborah James, landscape architect; Gregory Seale, architect; and Courtney Jones, historian. Information for this report was provided by Terrence J. Winschel, Historian, Vicksburg National Military Park. This is one in a series of reports prepared for the project. See also HAER Nos. MS-12, MS-14, MS-14B, and MS-14C.

The topography of Vicksburg National Military Park consists of a series of narrow ridges fronted and intersected by steep ravines, many of which are caused by small, intermittent streams. To achieve the desired effect of a continuous park roadway providing easy access to points of interest, it was necessary to cross many of these deep gorges. The result was the construction of nine Melan arch bridges along Union Avenue in 1903.

The Melan arch design[1] was chosen for nine of the twelve bridges in the park because of its adaptability, strength, and beauty. Even after nearly a century of use and wear, these are still very prominent structural features of these bridges. The bridges are similar in appearance, consisting of a single span and having decorative features such as triangular and rectangular inlays on the outside cheek walls as well as several concrete balustrades supporting two steel guardrails, which line either side of the deck. Minor differences among these structures are primarily in curvature of the arch, length of the span, and number of railing posts.

The construction process for these Melan arch bridges started with clearing vegetation from the banks of the ravine. Mule-drawn wagons and grading equipment were then used for the task of hauling dirt for the fills, which were necessary to complete the approaches. Once the fill dirt was properly packed, crews excavated areas in the fills on both sides of the ravine for the

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[1] According to Henry Grattan Tyrrell in his book, *History of Bridge Engineering*, (Chicago: The G.B. Williams Co., Printers, 1911), the Melan arch design was developed by Professor Josef Melan as the result of experiments sponsored by the Austrian government beginning in 1890. Melan's patents for the design were introduced in the United States in 1893 and gained widespread popularity during the following decade.

placement of abutment footings. This being completed, concrete for the footings was then poured.

The next phase of construction involved the creation of wooden forms for the abutment beams and the lower level of the arch. Wooden forms, which included a decorative design, were also made for the outside cheek walls. Once these forms were in place, curved railroad iron was placed atop the forms to be bedded in concrete to provide arch support. The arch was then formed in sections and concrete was poured one wheelbarrow-full at a time. Wooden forms were then constructed for the inside cheek walls and backed by dirt. After curing, these forms were removed and fill dirt was placed between the cheek walls, graded and packed to form the deck. Forms for balustrades were built atop the cheek walls and concrete was poured. A decorative iron guardrail was then placed between the balustrades to complete the structure. Finally, the concrete surfaces were sanded and painted. All nine bridges were completed by the end of 1903.

Few alterations have been made to these structures over the years. In the late 1950s excessive corrosion rendered the original railing on the bridges unsightly and unsafe. This historic railing was made of iron and formed contiguous circles, bordered on the top and bottom by a single rail. In 1960, the guardrail was replaced with the present railing, which consists of two steel rails supported by the balustrades. This was probably accomplished as part of Mission 66.[2] The only other change made to these structures was the asphalt surfacing which was added in the early 1970s. The paving of the bridge decks was part of the surfacing of Union Avenue as

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[2] See historical overview (HAER No. MS-14) for additional information on Mission 66.

a whole. A "chip and seal" surface was applied to the bridge decks in 1988. Future alterations will involve the eventual replacement of the bridges.

Constructed nearly a century ago by William T. Young,[3] the Melan arch bridges have withstood the test of time relatively well. Originally intended to accommodate horse and buggy traffic, the bridges are beginning to deteriorate under the stress of recreational vehicles and tour busses. To date, only one bridge has required closure and replacement. In 1987, the Federal Highways Administration (FHWA) compiled a Bridge Safety Inspection Report, rating Bridge 5600-006P as Level D (minor repair needed).[4] By 1991, changes in elevation along the deck were apparent and the bridge received a rating of Level C (moderate repair needed).[5] Within a year of that rating, the structure began to buckle. In response, Chief of Maintenance Mike Doelger established several stations along the bridge and elevation readings were taken over a period of months. These readings indicated vertical movement of over twelve inches from the northwest approach to the center of the bridge.[6] Warning signs were posted at the approach,

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[3] See historical overview (HAER No. MS-14) for additional information on Young.

[4] U.S. Department of Transportation, Bridge Safety Inspection Report, 5600-006P, Federal Highways Administration, Eastern Direct Federal Division, (Arlington, Virginia, 14 January 1987), 2.

[5] U.S. Department of Transportation, Bridge Safety Inspection Report, 5600-006P, Federal Highways Administration, Eastern Federal Lands Highway Division, (Sterling, Virginia, 6 February 1991), 2.

[6] U.S. Department of the Interior, National Park Service, Vicksburg National Military Park, Memorandum Mint Springs Bayou Bridge, Chief of Maintenance, VICK to Superintendent, VICK, (Vicksburg, Mississippi 13 May 1991).

instructing vehicles to slow to five miles per hour. The bridge continued to deteriorate, receiving a rating of Level B (major repairs needed), in 1993.[7] In 1996, the FHWA recommended closure and replacement of Bridge 5600-006P. Park officials, acting on this recommendation, closed a two-mile section of the tour road on 16 February 1996. The bridge was replaced with a box culvert and the road reopened in July 1997.

It is expected that the remaining bridges will also require eventual replacement, however, in the future bridges may possibly be replaced with structures of the same Melan arch design. This is desirable to maintain the appearance of uniformity originally established as an important aspect of the tour route.

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[7] U.S. Department of Transportation, Bridge Safety Inspection Report, 5600-006P, Federal Highways Administration, Eastern Federal Lands Highway Division, (Sterling, Virginia, 18 February 1993), 2.

SOURCES CONSULTED:

Landler, Juliet, "Addendum to Reinforced Concrete Arch Bridge," Historic American Engineering Record, No. IA-15, Library of Congress, August, 1995.

United States Department of the Interior, Vicksburg National Military Park, Memorandum Mint Springs Bayou Bridge, Chief of Maintenance, VICK to Superintendent, VICK, (Vicksburg, Mississippi 13 May 1991).

United States Department of Transportation, Bridge SafetyInspection Report, 5600-006P, Federal Highways Administration, Eastern Federal Lands Highways Division, (Arlington, Virginia, 14 January 1987).

U.S. Department of Transportation, Bridge Safety Inspection Report, 5600-006P, Federal Highways Administration, Eastern Federal Lands Highways Division, (Sterling, Virginia, 6 February 1991).

U.S. Department of Transportation, Bridge Safety Inspection Report, 5600-006P, Federal Highways Administration, Eastern Federal Lands Highways Division, (Sterling, Virginia, 18 February 1993).

U.S. Department of Transportation, Bridge Safety Inspection Report, 5600-006P, Federal Highways Administration, Eastern Federal Lands Highways Division, (Sterling, Virginia, 23 January 1996).

Tyrrell, Henry Grattan, *History of Bridge Engineering*, Chicago: The G.B. Williams Co., Printers, 1911.